UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/658,023	09/08/2000	Boris Kobrin	026827/0154	3422

7590 07/24/2002

Michael D. Kaminski
Foley & Lardner
Suite 500
3000 K Street, N.W.
Washington, DC 20007-5300

EXAMINER
OLSEN, ALLAN W

ART UNIT	PAPER NUMBER
1763	9

DATE MAILED: 07/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/658,023	KOBRIN ET AL.	
	Examiner	Art Unit	
	Allan W. Olsen	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) *5-14 and 21-24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 15-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6,8* .
4)☐ Interview Summary (PTO-413) Paper No(s). _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: .

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-4 and 15-20, drawn to a method of making and using a multi-layered mask in the manufacturing of a sub-micron structure, classified in class 216, subclass 022.

II. Claims 5 and 6, drawn to the mask used in the invention of group I, classified in class 430, subclass 015.

III. Claims 7, 8 and 11-14, drawn to a method of making and using a mask in the manufacturing of a sub-micron structure, classified in class 216, subclass 022.

IV. Claims 9 and 10, drawn to the mask used in the invention of group III, classified in class 430, subclass 014.

V. Claims 21-24, drawn to the apparatus used to make the masks of groups II and IV and used in carrying out the method of the group I and group III inventions, classified in class 156, subclass 345.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made by the process defined by the invention of group III.

Inventions I and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed (i.e. group I) does not require the particulars of the subcombination as claimed because it does not require that the photoresist have a thickness of about 4 -6 micrometers. The subcombination

has separate utility such as in the making of nonmagnetic structures wherein the process does not include the second photoresist layer of the combination.

Inventions I and IV are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made by the process defined by the invention of group III.

Inventions I and V are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for making non-magnetic structures or in the myriad of fabrication processes that require two etching chambers and a "silylation chamber".

Inventions II and III are related as product made and process of making. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made by the process defined by the invention of group I.

Inventions II and IV are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed (i.e. group II) does not require the particulars of the subcombination as claimed because it does not require that the photoresist have a thickness of about 4 -6 micrometers. The subcombination has separate utility such as in the making of nonmagnetic structures wherein the process does not include the second photoresist layer of the combination.

Inventions V and II are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the apparatus can be used for making magnetic structures or in any fabrication processes that require two etching chambers and a "silylation chamber".

Inventions III and IV are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made by the process defined by the invention of group I.

Inventions III and V are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for making non-magnetic structures or in any process that requires two etching chambers and a "silylation chamber".

Inventions V and IV are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the apparatus can be used for making magnetic structures or in any process that simply requires two etching chambers and a "silylation chamber".

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, and the search required for Groups I and II is not required for Groups II, IV or V, restriction for examination purposes as indicated is proper.

During a telephone conversation with Greg Rosenblatt on July 2, 2002 a provisional election was made with traverse to prosecute the invention of group I, claims 1-4 and 15-20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 5-14 and 21-24 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4 and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,665,251 issued to Robertson et al. (hereinafter, Robertson) in view of U.S. Patent 6,100,014 issued to Lin et al. (hereinafter, Lin).

Robertson teaches:

Claims 1, 2, 15: Robertson teaches a method of forming a magnetic pole tip. Robertson forms the pole tip by electroplating the magnetic pole material onto a seed layer that has an overlying multi-layered mask structure. The multi-layered mask comprises, sequentially from bottom to top, a first photoresist layer, hard mask layer and a second photoresist layer that is thinner than the first photoresist layer (see figure 5). Robertson teaches that the first photoresist layer is patterned with a reactive ion etching (RIE) process anisotropically etched to create a patterned first photoresist layer in which the pattern features have well defined vertical sidewalls (see column 2, lines 3-7 and figure 8).

Claims 4, 17: Robertson teaches that before the first photoresist layer is etched, the second photoresist layer is patterned and the underlying hard mask layer is etched, thereby exposing the first photoresist layer (see figures 6 and 7; column 5, line 63 - column 6, line 4).

Claim 16: Robertson teaches that it is desirable for magnetic pole tips to be made as narrow as possible, specifically, of sub-micron dimension (column 4, lines 32-41).

Claim 18: After the pole tip has been formed by the plating process, Robertson teaches removing the photoresist material (figure 12; column 6, lines 25-32).

Claim 19: Robertson teaches that the multi-layer mask is further comprises a protective layer disposed between the deed and first photoresist layers (figure 4; column 4, lines 62-63).

Claim 20: Robertson teaches using PERMALLOY™, a metallo-magnetic material, for the seed layer (column 4, lines 66-67).

Robertson does not teach:

Claims 1, 15: Robertson does not teach a silylation step to reduce the size of the features that have been patterned into the first photoresist layer.

Claim 16: Robertson does not teach forming a magnetic pole tip having a width of less than 0.3 μm.

Lin teaches:

Lin teaches that feature sizes of 0.25 μm are achievable through photolithographic methods. Lin teaches a method in which the minimum feature size obtainable through the photolithographic patterning of a photoresist, is further reduced. Lin teaches that the size of the openings in the resist pattern can be reduced by performing a silylation of the sidewalls of the resist pattern (column 2, lines 34-38, column 3, line 43 - column 4, line 34.)

Obvious combination of Robertson and Lin:

Because Robertson teaches that it is desirable to create the narrowest possible pole tip, it would have been obvious for one skilled in the art to carry out Robertson's method using a photolithographic protocol that would provide the smallest possible

feature size, such as the 0.25 μm noted by Lin. To achieve the narrowest possible pole tip, it would then be obvious to utilize Lin's method to further reduce the size of the opening in the photoresist pattern of Robertson because Lin's method is a very easy and cost-effective method of achieving this goal (Lin, column 4, lines 33-34).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson and Lin as applied to claim 1 above, and further in view of U.S. Patent 5,607,542 issued to Wu et al. (hereinafter, Wu).

The Robertson/Lin combination does not teach using an inductively coupled plasma (ICP) to etch the first photoresist layer.

Wu teaches a plasma etching method and apparatus that in which RF energy is inductively coupled to the plasma chamber.

It would have been obvious to one skilled in the art to use the apparatus of Wu to carry out the method made obvious by the Robertson/Lin combination because Wu teaches that a higher density plasma can be obtained with an ICP. Wu also teaches that an ICP is advantageous because the control of plasma density is independent from the control over the plasma ion energy (column 2, lines 8-14; column 3, lines 49-56; column 6, line 1 - column 7, line 6).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 703-306-9075. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Greg Mills, can be reached on 703-308-1633.

The examiner's Right-Fax (direct to desktop) phone number is 703-872-9684. Alternatively, the general fax numbers for TC1700 are 703-872-9310 (non-after finals) and 703-872-9311(after-final).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Allan Olsen, Ph.D.
July 19, 2002

Allan Olsen
Examiner A.U. 1763